Human Resources for Science & Technology:

The European Region

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Foreword

The adequacy of future human resources for science and engineering is an important issue for the United States. In 1993, the Division of Science Resources Studies (SRS) published an initial report on *Human Resources for Science and Technology: The Asian Region.* This current report is designed to further the understanding of global science and technology resources by providing a reliable database and analysis for the European region, which has a high concentration of the world's scientific resources. This report was prepared to provide information for U.S. decisionmakers in their assessments of trends in globalization, particularly on human resources. Many national and international organizations are interested in this topic. For example, the Organisation for Economic Co-operation and Development, the Commission of the European Communities, and the International Council of Scientific Unions have been active in discussing these topics.

This report complements and supplements the National Science Board's *Science and Engineering Indicators* volumes and several other reports prepared by the Division of Science Resources Studies.

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Division of Science Resources Studies
Directorate for Social, Behavioral,
and Economic Sciences

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Acknowledgments

This report was prepared by Jean M. Johnson, Senior Science Resources Analyst, Science and Engineering Indicators (IND) Program, Division of Science Resources Studies (SRS), National Science Foundation.

The database developed to prepare this report builds on data provided by the Division of Statistics of the United Nations Educational, Scientific, and Cultural Organisation (UNESCO) and the Center for Educational Research and Innovation (CERI) of the Organisation for Economic Co-operation and Development (OECD). Through an annual survey sent to more than 150 countries, UNESCO gathers worldwide data on higher education, research, and other dimensions of development, which it has generously provided to NSF. The report utilizes the research and development data from the OECD *Main Science and Technology Indicators.*

To verify and update the UNESCO and OECD degree data, NSF was fortunate in receiving full cooperation from individuals in Ministries of Education and in science and technology indicator groups in each of the European countries studied in this report. In addition to their other contributions, these individuals have provided their national primary sources on higher education so that NSF could develop a reliable data base on human resources for science and technology. Their names, affiliations and addresses are listed in the Contacts section of the report. This voluntary exchange of information is very encouraging and will assist SRS in completing other regional profiles.

Jennifer Sue Bond, Director of the Science and Engineering Indicators Program within SRS, supported the continuation of this research on human resources within the Division, suggested contacts in each of the European countries, and provided relevant OECD and national publications. William Blanpied, of the Division of International Programs, read an early draft and provided many useful suggestions and additional information on institutions of higher education.

The report also benefited from the comments provided by other colleagues in the Division of International Programs, and several external peer reviewers, including E. Stephen Hunt of the U.S. Department of Education, Philip W. Hemily of the National Research Council, Philip Altbach of the University of Boston, Peter Syverson of the Council of Graduate Schools, Richard A. Ellis of the American Association of Engineering Societies, Erika Rost of the Federal Ministry for Education, Science, Research and Technology in Germany, Kirsten Wille Maus of the Norwegian Institute for Studies in Research and Higher Education, Serge Plattard, Science Counselor of the French Embassy, Helen Connor of the University of Sussex, Lennart Stenberg of the Swedish National Board for Industrial and Technical Development, and Ian R. Perry of the Commission of the European Communities. Overall guidance and review were provided by Jennifer Sue Bond and Kenneth M. Brown. Editing of the report was performed by Friday Systems Services.

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Acronyms

CERN	European Center for Nuclear Research
EC	European Community
EFTA	European Free Trade Agreement
ESRF	European Synchrotron Radiation Facility
EU	European Union
FTE	Full-time equivalent
GDP	Gross domestic product
LHC	Large Hadron Collider
NS&E	Natural science and engineering
NSF	National Science Foundation
OECD	Organisation for Economic Co-operation and Development
PPP$	Purchasing power parity dollars
R&D	Research and development
RSE	Research scientist and engineer
S&E	Science and engineering
S&T	Science and technology
UNESCO	United Nations Educational, Scientific, and Cultural Organization